

Classification of parotidectomy: a proposed modification to the European Salivary Gland Society classification system

Wai Keat Wong¹ · Subhaschandra Shetty¹

Received: 6 March 2017 / Accepted: 19 April 2017 / Published online: 11 May 2017
© Springer-Verlag Berlin Heidelberg 2017

Abstract Parotidectomy remains the mainstay of treatment for both benign and malignant lesions of the parotid gland. There exists a wide range of possible surgical options in parotidectomy in terms of extent of parotid tissue removed. There is increasing need for uniformity of terminology resulting from growing interest in modifications of the conventional parotidectomy. It is, therefore, of paramount importance for a standardized classification system in describing extent of parotidectomy. Recently, the European Salivary Gland Society (ESGS) proposed a novel classification system for parotidectomy. The aim of this study is to evaluate this system. A classification system proposed by the ESGS was critically re-evaluated and modified to increase its accuracy and its acceptability. Modifications mainly focused on subdividing Levels I and II into IA, IB, IIA, and IIB. From June 2006 to June 2016, 126 patients underwent 130 parotidectomies at our hospital. The classification system was tested in that cohort of patient. While the ESGS classification system is comprehensive, it does not cover all possibilities. The addition of Sublevels IA, IB, IIA, and IIB may help to address some of the clinical situations seen and is clinically relevant. We aim to test the modified classification system for partial parotidectomy to address some of the challenges mentioned.

Keywords Parotidectomy · Classification · Level · European Salivary Gland Society

✉ Wai Keat Wong
waikeat.wong@northlanddhb.org.nz

¹ Department of Otolaryngology, Head and Neck Surgery, Whangarei Base Hospital, Maunu Road, Private Bag 9742, Whangarei, Northland 0148, New Zealand

Introduction

Among salivary gland neoplasms, more than two-thirds arise in the parotid gland. The vast majority of neoplasms in the parotid are benign, but about 15% are malignant. Pleomorphic adenoma is by far the commonest benign tumour [1]. As for malignant parotid tumours, the most common is mucoepidermoid carcinoma [2]. Other important causes for parotid malignancy include metastatic spread of skin cancers of the head and neck. Most benign tumours can be treated with superficial or deep lobe parotidectomy with facial nerve preservation. For malignant tumours, the extent and grade of tumour determine the extent of parotidectomy and a more radical excision is sometimes needed for high-grade malignancies.

The overarching theme for the surgical management of parotid tumour has been the incorporation of complete tumour extirpation to minimize recurrence while preserving facial nerve function. There exists a wide range of possible surgical options for a relatively straightforward surgical aim. The current trend is moving towards dissecting less of the facial nerve and reduces the amount of parotid tissue removed especially in managing benign parotid tumours [3–5]. The difference in extent of parotid tissue removal and facial nerve dissection is an important source of the multiple terminologies in parotid surgery [6–8]. Terms like limited superficial parotidectomy, subtotal parotidectomy, partial parotidectomy, and conservative parotidectomy have all been used in the literature. Such nonuniformity can be confusing and lack of standardisation hinders accurate communication among clinicians and researchers.

A systematic approach in describing the extent of parotidectomy is, therefore, needed. Recently, the European Salivary Gland Society (ESGS) proposed a novel

classification scheme in an attempt to standardize the reporting of parotidectomy. The ESGS classification represents a modification to the system originally proposed by Quer et al. [4]. According to the ESGS classification, the parotid gland can be divided into five “levels”, analogous to the system used in neck dissection. Level I corresponds to parotid tissue found lateral to the plane of the facial nerve and cranial to an imaginary line drawn from the facial nerve trunk to Stensen’s duct. Level II represents parotid tissue in the superficial lobe that is caudal to the abovementioned imaginary line. For the deep lobe, glandular element inferior to the imaginary line is labelled as Level III and, superiorly, Level IV. The accessory lobe is regarded as Level V [4]. It was felt that the ESGS classification could be used to make comparison among different series easier.

Further data, however, are required to characterize the clinical applicability of this novel classification scheme. The goal of the present study is to examine the feasibility of this system. Emphasis was placed on those levels that are not adequately considered by the ESGS classification. We propose a modification to the system as a means of addressing some of the clinical challenges faced. We sought to examine the clinical relevance of subdividing Levels I and II into Sublevels IA, IB, IIA, and IIB.

Method

At our institute, a prospectively maintained computerised database of all patients undergoing parotidectomy exists since June 2006. The database also contained detailed tumour maps delineating the size and location of each tumour and precise extent of resection performed.

Between June 2006 and June 2016, a total of 130 parotid operations were performed at our department.

Institutional ethics approval was obtained prior to the commencement of the study. Inclusion criteria were the presence of tumour involving the parotid gland as confirmed on clinical and radiological examination and subsequent parotid gland surgery. Additional diagnostic procedures included fine-needle aspiration (FNA) biopsy and computed tomography (CT) scanning for all patients. Patients who underwent extracapsular dissection, defined as tumour removal with cuff of parotid tissue without formal identification of the facial nerve, are also included. Exclusion criteria included transoral or transpharyngeal approaches for parotid tumour extirpation. Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this article. Demographic and

histopathologic data as well as extent of surgery were summarized in Table 1.

The tumour maps were evaluated and retrospectively correlated with the operation note and CT images. The European Salivary Gland Society (ESGS) Classification was applied. The ESGS classification divides the parotid gland into five levels. The levels are: I (lateral superior), II (lateral inferior), III (deep inferior), IV (deep superior), and V (accessory) (Fig. 1). The superior level is the area corresponding to the branch of the temporofacial nerve and the inferior level is the area of the cervicofacial branch. The separation between superior and inferior was established with an imaginary line connecting the bifurcation of the facial nerve trunk (in its two major branches (temporofacial and cervicofacial) with Stensen’s duct.

Patients were classified according to the parotid levels resected. During this exercise, it became apparent that not all cases could be adequately described using the current ESGS nomenclatures. We, therefore, performed a modification to the ESGS system as outlined in the following paragraph.

Proposed modification

A modification was made to the ESGS system. First, we subdivided parotid Level I into two additional Sublevels: IA and IB. The superior (temporofacial) division of facial nerve was used as the anatomic landmark to subdivide Level I into Sublevels IA and IB. Second, we divided parotid Level II into Sublevels IIA and IIB using the inferior (cervicofacial) division of facial nerve as a landmark (Fig. 2).

Surgical technique

EMG (electromyographic) monitoring (NIM Response; Medtronic, Minneapolis, MN, USA) was used in all cases. A modified Blair incision (Lazy S) was used in the majority of cases. Elevation of sub-SMAS (superficial musculoaponeurotic system) flap over the parotid fascia was carried out, followed by separation of parotid gland from anterior border of sternocleidomastoid. Greater auricular nerve is preserved if possible; otherwise, it is divided to facilitate exposure. Tragal pointer, tympanomastoid suture, and posterior belly of digastric are used as landmarks to identify the facial nerve trunk. Antegrade dissection along the facial trunk with careful tracing of the extent of relevant divisions and branches of facial nerve, using McCabe’s or mosquito forceps, and either bipolar or harmonic scalpel dissection of parotid parenchyma lateral to the facial nerve, was performed. Surrounding 1–2 cm cuff of normal parotid tissue resected except where tumour abuts facial nerve. Different extents of parotid resection as dictated by nature and location of tumour were employed. In superficial parotidectomy, all parotid tissues lateral to

Table 1 Demographic, pathological, and treatment characteristics

Age (years)	Mean 57.1
Gender M:F	1:1.13
Ethnicity	95:34:1
Caucasian: Maori/Polynesian: others	
Histology	
Benign	75.4% (n = 98)
Malignant (primary malignant)	8.5% (n = 11)
Malignant (regional metastasis from skin primary)	16.1% (n = 21)
Location of tumour	
Superficial	112
Deep lobe	15
Accessory lobe	3
Neck dissection	
Yes	24 (18.5%)
No	106 (81.5%)

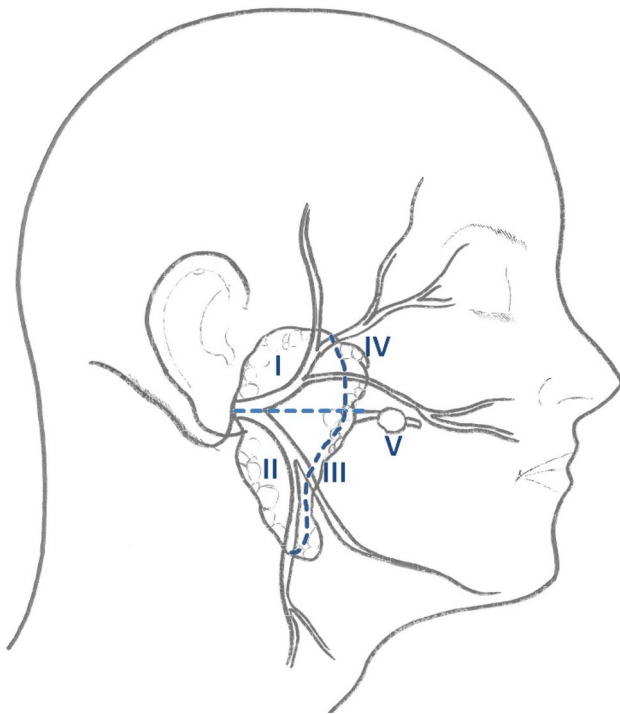


Fig. 1 ESGS classification where the parotid gland is divided into five levels. The superior level is the area corresponding to the temporofacial division of the facial nerve, and the inferior level corresponds to the cervicofacial division [4, 7]

plane of facial nerve are excised. In deep lobe tumour, the superficial lobe can either be preserved or resected.

Results

In total, 130 cases (126 patients with 4 patients having bilateral parotidectomies) were included in the series. Of the cases, 98 had benign pathology. 49 were found to be

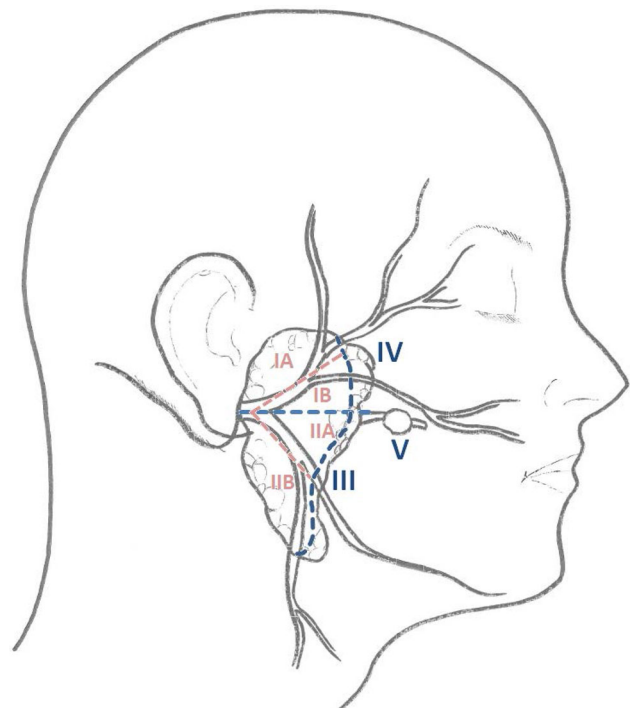


Fig. 2 Anatomic diagram of parotid depicting boundaries of the levels and sublevels as modified from the ESGS classification system

pleomorphic adenoma and 31 Warthin’s tumour on final pathology. 32 malignant tumours were recorded. 17 of them were metastatic squamous cell carcinoma (SCC), 4 melanoma, and 4 acinic cell carcinoma. There were only two cases of mucoepidermoid carcinoma (1.5%). 86.2% of tumours (112) were in the superficial lobe, with 33 being regarded as located in the tail of parotid. 14 (10.8%) tumours arise from deep lobe.

The extent of surgery is summarized in Table 2. Superficial parotidectomy (Parotidectomy I–II) which

Table 2 Extent of surgery ($n = 130$)

ESGS classification	Nomenclature	Proposed modification	n (%)
ECD I	Extracapsular dissection with tumour in Level I	ECD I	4 (3.1)
ECD II	Extracapsular dissection with tumour in Level II	ECD II	2 (1.5)
ECD V	Extracapsular dissection with tumour in Level V	ECD V	0
Parotidectomy I	Partial superficial parotidectomy	Parotidectomy I	9 (6.9)
		Parotidectomy IA	0
		Parotidectomy IB	0
Parotidectomy II	Partial superficial parotidectomy	Parotidectomy II	22
		Parotidectomy IIA	(16.9)
		Parotidectomy IIB	0
			1 (0.8)
Parotidectomy V	Accessory lobe removal	Parotidectomy V	1 (0.8)
Parotidectomy I–II	Superficial parotidectomy	Parotidectomy I–II	53
			(40.8)
Parotidectomy I–II–III	Superficial parotidectomy extended to the inferior deep lobe	Parotidectomy I–II–III	4 (3.1)
Parotidectomy III–IV	Deep lobe parotidectomy	Parotidectomy III–IV	6 (4.6)
Parotidectomy I–IV	Total parotidectomy with facial nerve preservation	Parotidectomy I–II–III–IV	2 (1.5)
Parotidectomy I–IV (VII)	Total parotidectomy with facial nerve resection	Parotidectomy I–II–III–IV (m)	1 (0.8)
Parotidectomy I–IV (VII, S, MM)	Extended total parotidectomy with facial nerve resection + skin and masseter muscle resection	Parotidectomy I–II–III–IV (VII, S, MM)	0
	Superficial parotidectomy extended to the superior deep lobe	Parotidectomy I, II, IV	1 (0.8)
	Partial superficial parotidectomy extended to the inferior deep lobe	Parotidectomy II–III	3 (2.3)
	Partial superficial and deep lobe parotidectomy	Parotidectomy II–III–IV	1 (0.8)
	Partial superficial parotidectomy and accessory lobe removal	Parotidectomy II–V	1 (0.8)
		Parotidectomy IB–IIA–V	1 (0.8)
	Partial superficial parotidectomy	Parotidectomy I–IIA	3 (2.3)
		Parotidectomy IB–II	8 (6.2)
		Parotidectomy IB–IIA	7 (5.4)

entailed removal of all parotid tissue lateral to the plane of facial nerve was the most commonly performed procedure (53 cases; 40.8%).

Discussion

We felt that the novel ESGS classification scheme, although comprehensive, is not perfect. In our series, we found instances where less than the full Level I and II were resected in a case of partial superficial parotidectomy. Based on the ESGS system, a partial superficial parotidectomy depicted in Fig. 3 (tumour between superior and inferior divisions) would be denoted as Parotidectomy I–II. This may be confusing as Parotidectomy I–II implies that the *entire* superficial lobe is resected. When the surgeon only removed part of Level I and part of Level II (when temporal and marginal mandibular branches are not dissected), the procedure is not accurately depicted by the ESGS system. We, therefore, proposed modifying the ESGS system by subdividing the superficial lobe into

Sublevels IA, IB, IIA, and IIB to address this particular scenario.

This modification is analogous to the division into sublevels used in neck dissection. The need to use a recognizable anatomical landmark cannot be overemphasized. We propose using the superior (temporofacial) division of facial nerve as the anatomic landmark to subdivide Level I into Levels IA and IB. The inferior (cervicofacial) division of facial nerve can be used to subdivide Level II into Levels IIA and IIB.

In this study, we found that partial superficial parotidectomy can be divided into either Parotidectomy I ($n = 9$, 6.9%) or Parotidectomy II ($n = 22$, 16.9%). No patients underwent Parotidectomy IA or IB on its own. Only one patient (0.8%) underwent Parotidectomy IIB and there was no recorded case of Parotidectomy IIA alone.

The absence of Parotidectomy IA, IB or IIA in our series may be due to a number of factors. First, 32 of 130 patients in our series had malignant parotid tumour, with 21 of them being metastatic cutaneous malignancies. This is not surprising as metastatic skin cancer is one of the most

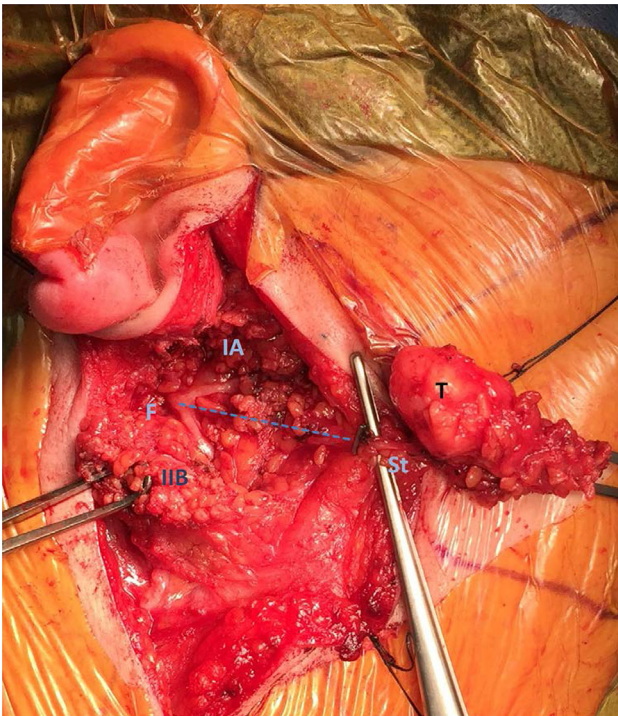


Fig. 3 Modified ESGS classification system. Tumour was situated between the two divisions of facial nerve trunk. The separation between Level I and II was achieved by drawing an imaginary line connecting the bifurcation of the facial nerve trunk (F) with Stensen's duct (St). The parotid parenchyma in Levels IA and IB were not resected and facial branches in that levels were not dissected

common forms of parotid malignancy in this part of the world [9]. When dealing with metastatic cutaneous malignancies in the parotid, our institutional policy is to perform a superficial parotidectomy (Parotidectomy I–II) as a minimum, usually along with neck dissection (either elective or therapeutic). Facial nerve is preserved unless pre- or intraoperatively, there is evidence that incomplete tumour excision will occur if facial nerve is preserved. It is likely that this treatment approach resulted in a more extensive clearance of parotid nodal basin. Isolated clearance of a sublevel alone is, therefore, oncologically unsuitable.

Second, there exists a wide variation as to the appropriate extent of surgery for small benign tumours. In our institute, a localized excision without formal exposure of the facial nerve trunk is sometimes employed [so-called extracapsular dissection (ECD)]. We had six cases that were dealt with using ECD. The indications for this technique are reported to be limited to discrete and mobile benign neoplasms less than 4 cm in size [10]. In other instances, benign tumours will be dealt with using a partial superficial parotidectomy approach with preidentification of facial nerve trunk and facial nerve dissection in an anterograde direction. It is our experience that tumours

greater than 2 cm would require identification of the facial nerve and it is our policy to tackle these tumours with a partial superficial parotidectomy approach. This may explain why parotidectomy involving a single sublevel did not take place as these tumours would have been dealt with using ECD or partial superficial parotidectomy involving at least 1 sublevel.

In our cohort, seven patients (5.4%) underwent Parotidectomy IB–IIA, which is essentially a form of partial superficial parotidectomy. In each of the seven cases, the tumour was located between the superior and inferior divisions of the facial nerve. By not dissecting the parotid parenchyma cranial to the superior division of the facial nerve, or caudal to the inferior division of the facial nerve, we have noticed a reduced percentage of gland removal. Therefore, the division into parotid sublevels IA, IB, IIA, IIB makes clinical sense. Whether or not this resulted in reduction of surgical times or complication and cure rates is unclear and is not addressed in this study.

We found that the ESGS classification system is useful for deep lobe tumours where less than all parotid parenchyma is removed. Deep lobe tumours resection can be performed via a number of approaches. In the traditional external approach, the superficial lobe can be resected or preserved. Not all deep lobe tumour removal requires performance of a complete lateral lobectomy, and in some instances, the superficial lobe may not even need to be resected at all [11]. This is certainly observed in our series—one patient underwent Parotidectomy II–III–IV and six underwent Parotidectomy III–IV. The parenchyma of the superficial parotid is dissected off the nerve to facilitate mobilization of the nerve and delivery of tumour from beneath the nerve. Although theoretically, deep lobe parotidectomy may also entail less than complete removal of the deep lobe, we have not found a single case in our 10-year series where only Level III or Level IV is resected, without at least partial or complete resection of the superficial lobe. Data from a much larger series from Poland consisting 607 cases also matched our findings [12].

We may be criticized for not further subdividing Levels III and IV into Sublevels IIIA/IIIB and IVA/IVB, respectively. We elected not to do so because of logistical reasons and to avoid creation of multiple sublevels that may not have any real clinical value. It appears appropriate not to divide them into sublevels. In addition, we did not have enough cases of deep lobe tumours to justify doing so. Third, because Levels III and IV lie deep to the facial nerve, dissection of these levels would require a certain degree of manipulation of the facial nerve, following superficial parotidectomy. Consequently, it may be difficult to determine the demarcations for the deep lobe sublevels as the facial nerve branches would have been shifted around.

Another issue is parotid resection involving superficial parotidectomy extended to the superior deep lobe (Levels I, II, and IV). We concur that it is rare, and certainly, this is substantiated by the Polish group [12]. We confirm the findings that Parotidectomy I–II–III is more common, i.e., deep lobe resections are more frequent in the inferior parotid as initially observed by the ESGS group [7]. This would support the ESGS recommendation of using Level III to denote the *inferior* deep lobe and Level IV to represent the *superior* deep lobe.

Tumours arising in the region inferior to the marginal mandibular branch of the facial nerve are defined as lower pole tumours. Some authors have highlighted the difficulty in classifying the lower pole as deep or superficial [5]. In lower pole tumours arising deep to the marginal mandibular branch, the surgical procedure is less difficult than that for resection of ‘true deep tumours’ arising in the upper pole of the parotid gland. This is because the surgeon only needs to protect and preserve the marginal mandibular branch [13]. In this instance, using the ESGS system, Parotidectomy II–III would accurately describe the surgery performed. In our series of 130 cases, only 3 patients (2.3%) underwent this procedure.

As mentioned, parotid tumours are rarely confined to one sublevel unless they are small. A tumour centered in Level IIB would sometimes still have extension into Level IIA and/or Level III (so-called tail of parotid or posterior inferior parotid). In our experience, it is unlikely that these tumours are suitable for isolated dissection of a sublevel, because the branches of the facial nerve including the marginal mandibular and cervical branches usually have a greater association with the nerves, necessitating meticulous dissection. Our dissection generally proceeds distally towards the lower divisions, and we tend to dissect out the marginal mandibular and cervical branches. This would explain why our data show that more than one sublevel is often resected. The findings from our report would, therefore, reflect the treatment style in our centre and may be different from other institutions. Therein highlighted the potential strength of our modified classification system, because subtle differences in treatment philosophy of each centre can be accurately reflected by this classification system. We speculate that if a retrograde approach is used, perhaps, there will be more of Parotidectomy IIB. This remains to be proven.

As mentioned earlier, a major issue with parotid surgery is confusing nomenclature [4, 8]. Some terms, which are used in the literature, can be ambiguous, especially if used without any further explanation. Conservative parotidectomy may imply that facial nerve is preserved (in the context of a complete removal of all parotid tissue) or partial removal of the superficial lobe of the parotid. The term subtotal parotidectomy has also been used to describe

less than complete superficial parotidectomy but pose the same conundrum as conservative parotidectomy. Total parotidectomy may denote removal of all parotid tissue in both superficial and deep lobes, but remains unclear as to whether the facial nerve is sacrificed or not. We felt that the term “conservative” should be avoided because of its lack of precision. Similarly, the term “limited parotidectomy” should be abandoned. The term “partial parotidectomy” can lack clarity as it may not be readily apparent as to which division is dissected.

Attempts to classify parotid surgery are not a new endeavour; however, there is a scarcity of data on this topic in the literature. Iizuka developed a classification system for partial parotidectomy where surgery is defined based on the part of the gland dissected in relation to the division of the facial nerve. The superficial lobe was divided into four segments which are segment 1 (over the upper division); segment 2 (middle portion, over both divisions); segment 3 (over the lower division); and segment 4 (most inferior portion, parotid tail) [6]. We noticed a similarity between Parotidectomy IB–IIA as defined by our modification of the ESGS system and Iizuka’s segment 2, although in the original paper, the authors did not clearly specify the anatomic landmarks that define the boundaries of this specific parotid level.

Tweedie et al. proposed classifying the parotid as either the upper, middle or lower segments based on the divisions of the facial nerve. The tail segment was excluded from the classification altogether as the authors claimed that the tail of the parotid is an inconsistent part of the gland and does not lie close to the facial nerve branches. Furthermore, it was claimed that tumours involving the tail are often dealt with extracapsular dissection, obviating the need for a formal dissection of the facial nerve [8].

The ESGS system has identified two broad categories of parotid surgery: parotidectomy and extracapsular dissection. For some time now, extracapsular dissection has been favored as an alternative for the treatment of discrete parotid tumours. Extracapsular dissection of benign parotid tumours is associated with a low rate of postoperative complications, a fact that is confirmed by the available literature. The ESGS clearly defined ECD as surgery without any formal attempt to dissect the facial nerve or less than 1 level is removed [4]. The use of ECD is institution dependent; in our centre, only six cases have been performed over a 10-year period.

This study has a number of weaknesses. Although the database (including tumour maps) was maintained prospectively, the ESGS classification (and its proposed modification) was applied retrospectively to the patient cohort. In addition, the exact extent and position of the tumour and resected tissue is often difficult to be determined with utmost precision, depending somewhat on

subjective estimation by the surgeon. Hence, future studies should evaluate its reproducibility. The standardized format does not necessarily reflect anatomical configurations of the individual patient, where significant variations may be seen.

Finally, the creation of sublevels can result in a lot of subgroups for further statistical analysis that, ironically, can add to the confusion surrounding parotid nomenclatures. Nevertheless, our utmost aim is to improve accuracy in the description of extent of parotidectomy. We concur that there is no real difference between the subgroups statistically, but this could be attributed to the small sample size of the study. These issues can be addressed by repeating the study in a much bigger cohort, and considering refinements and modifications as needed.

Conclusion

Our endeavour represents a work in progress, and there will be a need to provide future updates as new knowledge and ideas come to light. Implementation of a consistent classification system in daily practice should reduce variation from clinician to clinician and facilitate communication and conduct of clinical trials and audit. We suggest subdividing Levels I and II into Sublevels IA, IB, IIA, and IIB to address some of the clinical cases that we encountered.

Compliance with ethical standards

Funding No funding was received in relation to this study.

Conflict of interest Dr. Wai Keat Wong and Mr. Subhaschandra Shetty declare that there is no conflict of interest in relation to this study.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Li C, Xu Y, Zhang C, Sun C, Chen Y, Zhao H, Li G, Fan J, Lei D (2014) Modified partial superficial parotidectomy versus

- conventional superficial parotidectomy improves treatment of pleomorphic adenoma of the parotid gland. *Am J Surg* 208:112–118. doi:10.1016/j.amjsurg.2013.08.036
2. Pinkston JA, Cole P (1999) Incidence rates of salivary gland tumors: results from a population-based study. *Otolaryngol Head Neck Surg* 120:834–840
3. Johnson JT, Ferlito A, Fagan JJ, Bradley PJ, Rinaldo A (2007) Role of limited parotidectomy in management of pleomorphic adenoma. *J Laryngol Otol* 121:1126–1128. doi:10.1017/S0022215107000345
4. Quer M, Pujol A, Leon X, Lopez M, Garcia J, Orus C, Sanudo JR (2010) Parotidectomies in benign parotid tumours: “Sant Pau” surgical extension classification. *Acta Otorrinolaringol Esp* 61:1–5. doi:10.1016/j.otorri.2009.10.003
5. Yamashita T, Tomoda K, Kumazawa T (1993) The usefulness of partial parotidectomy for benign parotid gland tumors. A retrospective study of 306 cases. *Acta Otolaryngol Suppl* 500:113–116
6. Iizuka K, Ishikawa K (1998) Surgical techniques for benign parotid tumors: segmental resection vs extracapsular lumpectomy. *Acta Otolaryngol Suppl* 537:75–81
7. Quer M, Guntinas-Lichius O, Marchal F, Vander Poorten V, Chevalier D, Leon X, Eisele D, Dulguerov P (2016) Classification of parotidectomies: a proposal of the European Salivary Gland Society. *Eur Arch Otorhinolaryngol* 273:3307–3312. doi:10.1007/s00405-016-3916-6
8. Tweedie DJ, Jacob A (2009) Surgery of the parotid gland: evolution of techniques, nomenclature and a revised classification system. *Clin Otolaryngol* 34:303–308. doi:10.1111/j.1749-4486.2009.01953.x
9. O’Brien CJ, McNeil EB, McMahon JD, Pathak I, Lauer CS, Jackson MA (2002) Significance of clinical stage, extent of surgery, and pathologic findings in metastatic cutaneous squamous carcinoma of the parotid gland. *Head Neck* 24:417–422. doi:10.1002/hed.10063
10. Smith SL, Komisar A (2007) Limited parotidectomy: the role of extracapsular dissection in parotid gland neoplasms. *Laryngoscope* 117:1163–1167. doi:10.1097/MLG.0b013e31806009fe
11. Rea JL (2000) Partial parotidectomies: morbidity and benign tumor recurrence rates in a series of 94 cases. *Laryngoscope* 110:924–927. doi:10.1097/00005537-200006000-00006
12. Wierzbicka M, Piwowarczyk K, Nogala H, Blaszczyńska M, Kosiedrowski M, Mazurek C (2016) Do we need a new classification of parotid gland surgery? *Otolaryngol Pol* 70:9–14. doi:10.5604/00306657.1202390
13. Ichihara T, Kawata R, Higashino M, Terada T, Haginomori S (2014) A more appropriate clinical classification of benign parotid tumors: investigation of 425 cases. *Acta Otolaryngol* 134:1185–1191. doi:10.3109/00016489.2014.914246